EXHIBIT A2

U.S. Department of Justice

Carmen M. Ortiz
United States Attorney
District of Massachusetts

Main Reception: (617) 748-3100

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BY HAND DELIVERY

September 2, 2014

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Re: United States v. Dzhokhar Tsarnaev, Crim. No. 13-10200-GAO

Dear Counsel:

We write to provide additional expert information pursuant to the Court's August 18th order. In addition, as indicated in our Opposition to your Supplemental motion to compel expert disclosures, we are providing additional disclosures with respect to several expert witnesses who are not within the scope of the Court's August 18th order.

With regard to each of the expert witnesses listed below, the government has already provided their C.V.s, their detailed reports, their bench notes which detail the specific processes and measurements that they made with respect to each piece of evidence they examined, other underlying materials such as chain of custody documents, as well as the applicable standard operating and quality assurance procedures. Each of the experts followed generally accepted standards in their fields.

In addition to this letter, we are also providing you with additional underlying data and supporting materials that we received from the FBI laboratory. These materials are being provided on a disc labeled Supplemental Expert Jenks [SIC] Material 9/2/2014, labeled DT-0072896.

In addition, we are also providing a production disc labeled DT-0066458-DT-0072895, containing Bates-labeled supporting material related to the experts listed below, conveniently organized including reports, C.V.s, and in most cases, relevant case notes. We have previously provided these materials without Bates-labeling them. In addition, this disc contains preliminary translations of translations that we may finalize for purposes of exhibits. They are being

provided as a courtesy and in reliance that you do not intend to impeach the translators with any inaccuracies in these preliminary translations. In addition, this disc contains a report of examination of the defendant's computer which indicates key pieces of digital evidence, as well as evidence that will be used by the government's terrorism expert witnesses. Tomorrow, we anticipate providing you with the government's terrorism expert witness reports, as well as additional information about the digital devices that the government presently intends to introduce at trial.

In the course of our investigation, we discovered that there is an encrypted volume on Tamerlan Tsarnaev's laptop computer. Although you are already likely aware through other means, we are letting you know that we have determined that a password for this volume is allahuakbar1.

Massachusetts State Police

1. MSP Lieutenant David Cahill is an expert in ballistics. His qualifications are summarized in his c.v.

Lieutenant Cahill will testify that the Ruger P95 semi-automatic pistol identified in MSP Case No. 13-08140 as Item No. 4-1 ("the Ruger") fired the following items: (a) the cartridge casings and projectiles identified in MSP Case No. 13-08140 as Item Nos. 4-54 through 4-78, 4-80 through 4-111, 4-122, 4-125, 5-80, 5-81, 6-2, 61-3, and 61-5; and (b) the cartridge casings and projectiles identified in MSP Case No. 13-08091 as Item Nos. 7-6 through 7-15. It is also his opinion that the projectiles identified in MSP Case No. 13-08140 as Item Nos. 61-1, 61-3, and 61-5 have the same class characteristics as the Ruger.

The basis for Lieutenant Cahill's opinion with respect to the projectiles is that the class characteristics of the Ruger (e.g., the pitch, twist, number, and width of the barrel's lands and grooves), as well as the barrel's individual characteristics (e.g., striations along the lands and grooves), as made manifest on test-fired projectiles, matched the markings on the recovered projectiles. The basis for his opinion with respect to the casings is that the class characteristics of the casings (e.g., manufacturer, shape and caliber) matched the Ruger, and their individual characteristics (e.g., firing pin aperture sheer marks, firing pin drag marks, and breech face marks) matched the corresponding characteristics of casings ejected from the Ruger during a test fire.

2. Trooper Christopher Donahue is a fingerprint expert. His qualifications are summarized in his c.v.

Trooper Donahue will testify that: (a) The discharged cartridge casings identified in MSP Case. No. 13-08091 as Item Nos. 7-6 through 7-10, the Ruger, and the discharged cartridge casings identified in MSP Case No. 13-08140 as Item Nos. 4-54 through 4-111, all possessed friction ridge detail that lack sufficient quality and quantity to conduct any further comparison(s). (b) It is unusual for guns or discharged cartridge casings to possess friction ridge detail of sufficient quality and quantity to conduct further comparison(s). (c) In MSP Case No. 13-

08140, Item 4-2 contained two developed areas of friction ridge detail (Item Nos. 4-2.4 and 4-2.5, respectively). Item No. 4-2.4 matched Item No. 15-1 (inked fingerprints of Tamerlan Tsarnaev), digit 8, and Item No. 4-2.5 matched Item No. 15-1 (inked palm print of Tamerlan Tsarnaev), left palm. (d) In MSP Case No. 13-08140, the ammunition box identified as Item No. 4-129 contained a developed area of friction ridge detail (Item No. 4-129.8), which matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), digit 8. (e) The ammunition box contained a live round, Item No. 4-129.2, which contained a developed area of friction ridge detail, Item No. 4-129.2.1, which matched Item No. 15-1 (inked fingerprints of Tamerlan Tsarnaev), digit 1. It also contained another live round, Item No. 4-129.4, which contained a developed area of friction ridge detail, Item No. 4-129.4.1, which matched Item No. 15-1 (inked palm print of Tamerlan Tsarnaev). (f) In MSP Case No. 13-08140, the pellet gun identified as Item No. 4-131 contained a developed area of friction ridge detail, Item No. 4-131.5, which matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), digit 2.

The basis for Trooper Donahue's opinions is his comparison of the recovered prints with the inked prints using the ACE-V method and his interpretation of the results in light of his education, training, and experience. Specifically, in each case, Trooper Donahue found that the ridges recovered from the questioned item and the known ridges (i.e. the ridges in the inked print used for comparison) had the same characteristics, the same relative lengths, and the same position relative to each other, with no unexplainable dissimilarities, in a sufficient number to convince him, based on his training and experience, that the recovered ridges and the known ridges are a match. The ridge characteristics he considered include ending ridges, converging ridges, and dots. In conformance with standards established by the International Association for Identification, there is no established minimum number of characteristics required to make individualizations or matches. Each match was independently verified by two other qualified experts, at least one of whom was a supervisor.

Trooper Donahue's opinions are based on the following premises: Friction ridge skin bears a complex, unique and persistent morphological structure. Notwithstanding the pliability of friction ridge skin, the contingencies of touching a surface, and the nature of the matrix, an impression of friction ridge skin structure may be left following contact with a surface. This impression may display features of varying quality (clarity of ridge features) and specificity (weighted values and rarity). Notwithstanding variations in clarity and specificity, the unique aspects of friction ridge skin may be represented as highly discriminative features in impressions. An impression that contains sufficient quality and quantity of friction ridge features can be individualized to, or excluded from, a source. The use of a fixed number of friction ridge features as a threshold for the establishment of an individualization is not scientifically supported.

3. John Drugan is a supervisory chemist in the Arson and Explosives Unit of the MSP Crime Laboratory. His qualifications are summarized in his c.v.

Mr. Drugan will testify that he examined the following items in Case No. 13-08091: (a) Item No. 2-7, which contained one Gunshot Primer Residue collection stub labeled "D-(1) stub MIT Police car #285." (b) Item No. 3-1, which contained two gunshot primer residue collection

stubs labeled "A-Right hand" and "B-Left hand." He will also testify that he examined the following items in Case No. 13-08140: (a) Item Nos. 12-9.8 and 12-9.9, which contained gunshot primer residue stubs labeled "a-12-9.8" and "b-12-9.9," respectively.

Mr. Drugan will testify he performed an SEM-EDS examination on each stub for the presence of gunshot primer residue and found particles characteristic of gunshot primer residue on each of them. In the case of Item No. 2-7 in Case No. 13-08091 and Items No. 12-9.8 and 12-9.9 in Case No. 13-08140, that result indicates the item may have been in the vicinity of a firearm when it was discharged or may have come into contact with an item with gunshot primer residue on it. In the case of Item No. 3-1 in Case No. 13-08091, that result indicates the individual may have discharged a firearm, may have been in the vicinity of a firearm when it was discharged, or may have come into contact with an item with gunshot primer residue on it.

Mr. Drugan will testify that firing a weapon produces combustion of both the primer and powder of the cartridge. The residue of the combustion products (i.e. gunshot residue) can consist of both burned and unburned primer or powder components and can be used to detect a fired cartridge. Gunshot residue may be found on the skin or clothing of the person who fired the gun, on an entrance wound of a victim, or on other target materials at the scene.

The major primer elements are lead (Pb), barium (Ba), or antimony (Sb). Usually, all three are present. Less common elements include aluminum (Al), sulfur (S), tin (Sn), calcium (Ca), potassium (K), chlorine (Cl), copper (Cu), strontium (Sr), zinc (Zn), titanium (Ti), or silicon (Si). The cartridge case, bullet, bullet coating, and metal jacket also contain specific elements that can be detected. Virtually all cartridge cases are made of brass (70% copper and 30% zinc). A few have a nickel coating. Primer cases are of similar composition (Cu-Zn). Bullet cores are most often lead and antimony, with a very few having a ferrous alloy core. Bullet jackets are usually brass (90% copper with 10% zinc), but some are a ferrous alloy and some are aluminum. Some bullet coatings may also contain nickel.

An SEM is a scanning electron microscope. Backscattered electron images in an SEM display compositional contrast that results from different atomic number elements and their distribution. Energy Dispersive Spectroscopy (EDS) allows one to identify what those particular elements are and their relative proportions. Simply stated, an X-ray analyzer is beamed directly onto the particles visualized with SEM so that an energy dispersive pattern can be generated, giving the elemental composition of the particles.

4. Michelle Levasseur is an MSP forensic chemist. Her qualifications are summarized in her c.v.

Ms. Levasseur will testify that on April 19, 2013, at approximately 3:00 a.m., at Beth Israel Hospital, she collected samples on SEM stubs from Tamerlan Tsaranev's hands using a gunshot residue trace evidence kit. The stubs were labeled "A-Right hand" and "B-Left hand" and together labeled Item No. 3-1 in Case No. 13-08091.

5. Trooper Patrick Moynihan is a fingerprint expert. His qualifications are summarized in his c.v.

Trooper Moynihan will testify that, in Case No. 13-08140: (a) Item No. 13-1.1, a friction ridge impression found on the exterior of the rear passenger door of the Mercedes ML350 with MA registration 137NZ1 ("the Mercedes"), matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), left middle finger. (b) Item No. 13-1.2, a friction ridge impression found on the exterior of the rear passenger door of the Mercedes, matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), left index finger. (c) Item No. 13-1.3, a friction ridge impression found on the exterior of the gas tank door of the Mercedes, matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), right index finger. (d) Item No. 13-1.4, a friction ridge impression found on the exterior of the rear passenger door of the Mercedes, matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), left index finger. (e) Item No. 13-1.16, a friction ridge impression found on the exterior of the rear driver's side door of the Mercedes, matched Item No. 15-1 (inked fingerprints of Tamerlan Tsarnaev), left index finger. (f) Item No. 13-1.17, a friction ridge impression found on the exterior of the front hood on the passenger side of the Mercedes, matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), left ring finger. (g) Item No. 13-1.18, a friction ridge impression found on the exterior of the front corner lens on the passenger side of the Mercedes, matched Item No. 15-1 (inked fingerprints of Tamerlan Tsarnaev), left palm. (h) Item No. 13-1.21, a friction ridge impression found on the exterior of the exterior of the front hood on the passenger side of the Mercedes, matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), left middle finger; (i) Item No. 13-1.23, a friction ridge impression found on the exterior of the gas tank door of the Mercedes, matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), right index finger. (j) Item No. 13-1.38, a friction ridge impression found on the inside of the interior door handle of the front driver's door of the Mercedes, matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), left ring finger. (k) Item No. 13-1.39, a friction ridge impression found on the inside of the interior door handle of the front driver's door of the Mercedes, matched Item No. 15-1 (inked fingerprints of Tamerlan Tsarnaev), left middle finger. (l) Item No. 13-1.43, a friction ridge impression found on the inside of the interior door handle of the front passenger side door of the Mercedes, matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), right middle finger. (m) Item No. 13-1.44, a friction ridge impression found on the inside of the interior door handle of the rear passenger side door of the Mercedes, matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), right middle finger. (n) Item No. 14-1.3, a friction ridge impression found on the exterior of the front passenger side door of the Honda Civic with MA registration 116GC7 ("the Honda") matched Item No. 15-1 (inked fingerprints of Tamerlan Tsarnaev), right middle finger. (o) Item No. 14-1.5, a friction ridge impression found on the exterior of the rear driver's side door of the Honda, matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), right index finger. (p) Item No. 14-1.7, a friction ridge impression found on the radio faceplate of the Honda, matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), right index finger. (q) Item No. 14-37.2, a friction ridge impression found on an iPod in the center console of the Honda, matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), right thumb.

The basis for Trooper Moynihan's opinions is his comparison of the recovered prints with the inked prints using the ACE-V method and his interpretation of the results in light of his education, training, and experience. Specifically, in each case, Trooper Moynihan found that the ridges recovered from the questioned item and the known ridges (i.e. the ridges in the inked print used for comparison) had the same characteristics, the same relative lengths, and the same relative position to each other, with no unexplainable dissimilarities, in a sufficient number to convince him, based on his training and experience, that the recovered ridges and the known ridges were a match. The ridge characteristics he considered include ending ridges, converging ridges, and dots. In conformance with standards established by the International Association for Identification, there is no established minimum number of characteristics required to make individualizations or matches. Each match was independently verified by two other qualified experts, at least one of whom was a supervisor.

Trooper Moynihan's opinions are based on the following premises: Friction ridge skin bears a complex, unique and persistent morphological structure. Notwithstanding the pliability of friction ridge skin, the contingencies of touching a surface, and the nature of the matrix, an impression of friction ridge skin structure may be left following contact with a surface. This impression may display features of varying quality (clarity of ridge features) and specificity (weighted values and rarity). Notwithstanding variations in clarity and specificity, the unique aspects of friction ridge skin may be represented as highly discriminative features in impressions. An impression that contains sufficient quality and quantity of friction ridge features can be individualized to, or excluded from, a source. The use of a fixed number of friction ridge features as a threshold for the establishment of an individualization is not scientifically supported.

6. Parker Putnam is a forensic scientist in the MSP Crime Laboratory. His qualifications are summarized in his c.v.

Mr. Putnam will testify that he used acid to etch scratch marks on the left of the Ruger's handle, resulting in partial restoration of the Ruger's obliterated serial number. The number restored was (3,5) (1,4) 7 * 7 6 9 3, where () indicates a possible number due to an incomplete restoration and * indicates a number that could not be identified.

7. Trooper Colleen Tanguay is an MSP fingerprint expert. Her qualifications are summarized in her c.v.

Trooper Tanguay will testify that, in Case No. 13-08140: (a) Item No. 13-1.1, a friction ridge impression found on the exterior of the rear passenger door of the Mercedes ML350 with MA registration 137NZ1 ("the Mercedes"), matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), left middle finger. (b) Item No. 13-1.2, a friction ridge impression found on the exterior of the rear passenger door of the Mercedes, matched Item No. 34-1 (inked fingerprints of Dzhokhar Tsarnaev), left index finger.

The basis for Trooper Tanguay's opinions is her comparison of the recovered prints with the inked prints using the ACE-V method and her interpretation of the results in light of her

education, training, and experience. Specifically, in each case, Trooper Tanguay found that the ridges recovered from the questioned item and the known ridges (i.e. the ridges in the inked print used for comparison) had the same characteristics, the same relative lengths, and the same relative position to each other, with no unexplainable dissimilarities, in a sufficient number to convince her, based on her training and experience, that the recovered ridges and the known ridges were a match. The ridge characteristics she considered include ending ridges, converging ridges, and dots. In conformance with standards established by the International Association for Identification, there is no established minimum number of characteristics required to make individualizations or matches. Each match was independently verified by two other qualified experts, at least one of whom was a supervisor.

Trooper Tanguay's opinions are based on the following premises: Friction ridge skin bears a complex, unique and persistent morphological structure. Notwithstanding the pliability of friction ridge skin, the contingencies of touching a surface, and the nature of the matrix, an impression of friction ridge skin structure may be left following contact with a surface. This impression may display features of varying quality (clarity of ridge features) and specificity (weighted values and rarity). Notwithstanding variations in clarity and specificity, the unique aspects of friction ridge skin may be represented as highly discriminative features in impressions. An impression that contains sufficient quality and quantity of friction ridge features can be individualized to, or excluded from, a source. The use of a fixed number of friction ridge features as a threshold for the establishment of an individualization is not scientifically supported.

8. Jennifer Montgomery is a forensic scientist in the MSP DNA Unit. Her qualifications are summarized in her c.v.

Ms. Montgomery will testify that DNA is found in cell nuclei and encodes the information that makes an individual unique. A person gets half of his DNA from his father and half from his mother. Each cell in a person's body contains a complete copy of the person's DNA. Although 99.9% of the DNA in humans is identical, the remainder is so variable that no two persons, other than identical twins, have exactly the same DNA.

The basic building blocks of DNA are called nucleotides. Chromosomes are long chains of nucleotides. Segments of a chromosome are called genes. Genes determine physical traits (among other things). For example, there is a gene for eye color. In every person the gene for eye color can be found on the same place on the same chromosome. But the gene itself is not identical in every person: the chain of nucleotides that forms the gene can vary from person to person. These variations are called alleles. Alleles are responsible for the genetic differences among us.

Certain alleles consist of short tandem repeats or STRs, i.e. short nucleotide sequences that repeat over and over. Polymorphic alleles are ones in which the number of times the sequence repeats tends to vary from person to person. Scientists have identified many sites, or loci, in the human genome where polymorphic alleles consisting of variable short tandem repeats or VSTRs can be found. They have also calculated the likelihood that any two people will have

the same number of STRs at each such site. Typically, the likelihood that two different people will have the same number of STRs at a given site is 20% or less. The more sites that are looked at, the less likely it is that two different people will have the same number of STRs at each of those sites.

Ms. Montgomery will testify that she extracted DNA from blood contributed by Dzhokhar Tsarnaev (Case No. 13-08091, Item 12-1.1.1), saliva contributed by Tamerlan Tsarnaev (Case No. 13-07864, Item 15-1.1), and hair contributed by Officer Sean Collier (Case No. 13-08091, Item 10-4.1). The DNA samples were extracted and amplified using Applied Biosystems AmpFISTR Identifiler kits and electrophoresed on an ABI 310 or ABI 3130xl genetic analyzer for STR fragment analysis. The AmpFISTR Identifiler profiles (i.e. counts the number of STRs) at 15 particular genetic loci. It also provides a value for Amelogenin (sex indicator).

Ms. Montgomery also extracted DNA from blood found on various locations on the pair of gloves recovered from the Tsarnaev's Honda that they abandoned on Laurel Street. The blood samples in question are Item Nos. 12-9.1.1, 12-9.3.1, 12-9.5.1, and 12-9.6.1 in Case No. 13-08140. These DNA samples were likewise extracted and amplified using Applied Biosystems AmpFISTR Identifiler kits and electrophoresed on an ABI 310 or ABI 3130xl genetic analyzer for STR fragment analysis.

She will testify that: (a) The blood recovered from the exterior palmar side of the right glove (Item No. 12-9.1.1) had a DNA profile that matched Officer Sean Collier's DNA profile but did not match Tamerlan or Dzhokhar Tsarnaev's. The expected frequency of a randomly selected unrelated individual having a DNA profile matching that obtained from this item is smaller than 1 in 1.6 quintillion among the Caucasian population and even smaller among other populations. (b) DNA profiling of the blood recovered from the exterior dorsal side of the pinky of the left glove (Item No. 12-9.3.1) indicated the presence of a mixture of DNA from more than one source. The major DNA profile from this blood matched Officer Sean Collier's DNA profile but did not match Tamerlan or Dzhokhar Tsarnaev's profiles. The expected frquency of a randomly selected unrelated individual having a DNA profile matching that obtained from this item is smaller than 1 in 1.6 quintillion among the Caucasian population and even smaller among other populations. (c) DNA profiling of the blood recovered from the interior palmar side of the left glove's thumb, index, middle, and ring fingers (Item No. 12-9.6.1) indicated a mixture of DNA from at least two individuals. The major DNA profile from this blood matched Tamerlan Tsamaev's DNA profile but did not match Dzhokhar Tsarnaev's or Officer Sean Collier's. The expected frequency of a randomly selected unrelated individual having a DNA profile matching that obtained from this item is smaller than 1 in 3 quintillion among the Caucasian population and even smaller among other populations. (d) DNA profiling of blood recovered from the palmar side of the right glove (Item No. 12-9.5.1) indicated a mixture of DNA from at least three individuals. Both Tamerlan and Dzhokhar Tsarnaev's profiles are included as potential contributors in this DNA mixture.

Ms. Montgomery analyzed the unknown and known samples using the "PCR/STR" method, that is, she used polymerase chain reaction ("PCR") to amplify each sample, and then

used the short tandem repeat method ("STR") to ascertain similarities or differences among alleles located at a certain number of loci in each sample. The PCR method is a well established, peer reviewed laboratory process that copies a chosen portion of a DNA sequence millions of times, the point being to generate enough of a sample for testing purposes. The technique can be performed on miniscule amounts of DNA, which makes it especially useful for forensic analysis. The process is similar to the mechanism by which DNA duplicates itself normally, and consists of three steps. First, each double-stranded segment of DNA is separated into two strands by heating. Second, these single-stranded segments are hybridized with primers, short DNA segments that complement and define the target sequence to be amplified. Third, in the presence of the enzyme DNA polymerase, and the four nucleotide building blocks (A, C, G, and T), each primer serves as the starting point for the replication of the target sequence. A copy of the complement of each of the separated strands is made, so that there are two double-stranded DNA segments. This three-step cycle is repeated, usually 20-35 times. The two strands produce four copies; the four, eight copies; and so on until the number of copies of the original DNA is enormous. In performing the PCR method on both samples, Ms. Montgomery will testify, she followed strict anti-contamination procedures, including the use of control tests to ensure that no foreign DNA contaminated the samples.

Once the amount of DNA in each sample was amplified by PCR, Ms. Montgomery performed capillary electrophoresis on the amplified samples to separate the different genetic regions -- the alleles -- for interpretation and analysis. Capillary electrophoresis is a method of separating DNA fragments (including short tandem repeats) according to their lengths. A long, narrow tube is filled with an entangling polymer or other seiving medium, and an electric field is usd to pull DNA fragments placed at one end of the tube through medium. Analysis was then performed using the STR method to determine similarities or differences between alleles present at each locus within each sample. STR is a well-established, peer-reviewed technique for DNA profiling. Because this method focuses on short sequences of a few nucleotide units, STRs can easily be amplified using the PCR method. The method also allows the use of a high number of loci. (In this case, Ms. Montgomery used allele sequences from 15 different loci in each sample.)

Ms. Montgomery will then testify about the statistical analysis she performed with respect to the matches between the known and questioned DNA samples, and how she calculated the statistical significance of the match by performing a random match expected frequency analysis. As noted in her report, through the use of statistical databases containing genetic information on Caucasian, African, and two Hispanic populations, Ms. Montgomery was able to predict the expected frequency of randomly selecting from a given population a person whose DNA profile happened to match that of the unknown sample at all 15 loci.

Ms. Montgomery will also testify that, after completing her analysis, another examiner at the MSP lab reviewed her findings to ensure that all procedures were performed correctly, the results were accurately interpreted, and the conclusions were correct. This review confirmed Ms. Montgomery's conclusions. Ms. Montgomery will also testify that she followed proper evidence handling techniques and requirements throughout the process of DNA extraction, amplification, and identification.

FBI

1. SSA Edward Knapp – Explosives

Qualifications
SSA Edward Knapp is employed at the FBI Laboratory in Quantico, Virginia and is an Explosives and Hazardous Device examiner at the Explosives Analysis Unit at the Lab. As explained in detail in his previously provided resume, SSA Knapp has extensive training and experience in the field of explosives analysis, construction, and explosion analysis. SSA Knapp has testified as an Explosives expert previously in federal court. SSA Knapp will testify as an Explosives expert based on his knowledge, skill, experience, training and education. SSA Knapp drafted a 111 page report which describes the items that he reviewed, his conclusions, and the basis for those conclusions. That report is provided again with this disclosure, and is incorporated herewith.

Summary of Testimony
SSA Knapp will describe the phases of a bombing investigating, namely, securing the crime scene, collecting evidence, and forensically analyzing it to determine the nature and cause of the explosion. He will testify that he oversaw the bombing-related forensic analysis of all of the evidence in this case, including evidence collected from the Boston and Watertown crime scenes, 410 Norfolk Street, Dzhokhar Tsarnaev's dormitory room, the Crapo landfill, Dung Meng's Mercedes, and the Tsarnaevs' Honda CRV. He personally examined each of the items referenced in his report and supervised the analysis of them by others. In his testimony, he will identify the items that were analyzed, who analyzed them, and what they concluded. (All of this information is detailed in his report).

SSA Knapp will explain the general properties of explosives materials, the principles and physics behind the explosion of low-explosive IEDs, as well as the safety concerns with assembling such a device. He will explain that the effects of an explosion are created through the action of several rapidly occurring events, including a blast wave, deflagration, violent expulsion of fragments of the casing and of shrapnel such as nails or bbs that were added to the device. The blast may also produce high heat and a fireball. In most cases the seat of the explosion is apparent from burn marks and the location of recovered evidence. Finally, the detonation of low-explosive devices typically results in the emission of a sulfuric smell and a loud noise that can damage or destroy hearing.

SSA Knapp will testify that all of the explosions in this case resulted from deflagration of low-explosives within containers, namely pressure cookers and pipes. He will testify that the two IEDs deployed at the Marathon consisted of a pressure cooker container, a main explosive charge, a fuzing system, and fragmentation and assembly materials such as a variety of paper, cardboard, adhesives, sealants and tapes. More specifically, he will testify that the containers were consistent with "Fagor" brand pressure cookers. The explosives were consistent with a pyrotechnic mixture. Each fuzing/triggering system consisted of a transmitter/receiver pair, speed controller, power source (i.e. batteries), and light bulb filament. The two fuzing/triggering

systems were distinct and incompatible with one another, i.e. the device used to trigger each bomb could not have been used to trigger the other. The bombs were placed inside backpacks for concealment and transportation. The Scene A backpack was consistent with a "Ful" brand backpack while the Scene B backpack was consistent with a "Fox" brand backpack.

SSA Knapp will testify that the Watertown bombs consisted of a pressure cooker bomb, several pipe bombs, and a plastic container bomb. The pressure cooker bomb had two triggering mechanisms. One was a hobby fuse and one was a toggle switch attached to a power source and connected via a wire to an initiator. All of the Watertown bombs contained fragmentation, low explosive powder, and assembly materials consistent with those in the bombs deployed at the Boston Marathon. Each had a toggle-switch or hobby-fuse triggering system, main charge, and fragmentation and assembly materials.

SSA Knapp will base this testimony on his examination of: (a) evidence recovered from the scene, including the shredded remains of backpacks, fragments of pressure cookers, and the remains of specific brands of electronic components; (b) "Ful" and "Fox" brand backpacks, Fagor brand pressure cookers, and other items that he either observed on manufacturer websites or obtained and examined at the Lab, which were consistent with the items found at the scene; (c) items recovered from 410 Norfolk Street and the Honda, including bbs, nails, sealants, tapes, rosin paper, and black powder residue, all of which were consistent with items found at the bombing scenes; (d) pyrotechnics and black powder recovered from Tsarnaev's dorm room and/or from the Crapo Landfill, which were also consistent with the powder used in the bombs; (e) strings of mini-lights recovered from 410 Norfolk Street with some of them missing (suggesting that lights were removed, experimented with, and ultimately used to create the IEDs; (f) the gasket from a Fagor pressure cooker recovered from 410 Norfolk Street (which is significant because in constructing the pressure cooker IEDs the corresponding gaskets appear to have been removed); (g) other items (such as hobby fuse) and tools found at 410 Norfolk Street that appear to have been used to make the IEDs,

SSA Knapp will testify that publicly available documents, including Inspire Magazine, accurately describe how to create a viable IED.

SSA Knapp will describe the results of the actual explosions in this case (i.e. the emission of heat, light, flame, noise, sulfuric odor, shockwave, and the violent, high-velocity dispersal of bomb parts and shrapnel), as well as what would have resulted had the unexploded IEDs detonated. He will testify about the radius and trajectory of the blasts. He will also testify that the bombs were designed to destroy property and to injure, maim and kill people. He will base this testimony primarily on the nature of the bombs and the materials used to make them. They were devices filled with low explosive powder capable of withstanding the build up of high pressure before exploding, and they were filled with small-gauge shrapnel such as bbs and nails. When a bomb of that design explodes near people, it tends to kill or injure them by blowing away their limbs, perforating and shredding their flesh, severing their blood vessels, breaking their bones, burning their flesh, and damaging their hearing.

SSA Knapp will testify about facsimile bombs that the Lab constructed from the same types of components used in the Marathon bombs. He will compare the devices, identify their components, and describe how they operated. He will explain the steps needed to create such bombs, which include: obtaining needed materials; extracting low-explosive powder from pyrotechnics and crushing it; preparing a mini-light filament to ignite the low-explosive powder; mating a remote-control receiver with a transmitter (which included using cannibalized remote-control vehicle chassis and electronics); using a speed controller to send an electrical signal; positioning components within a pressure cooker container; sealing the container so that the pressure would build to maximum capacity before explosion; creating a fragmentation sleeve within the pressure cooker; using paper products to separate components in order to avoid interference; modifying transmitters to make them easier to hide; using hobby fuse as a back-up; and using a safety toggle or "suicide" switch. He will also explain some of the dangers of making such bombs, such as the possibility of inadvertently triggering an explosion through friction or by accidentally sending a live electrical charge through the radio-controlled trigger.

SSA Knapp's methodology is documented in his report and underlying notes. That methodology is consistent with the Standard Operating Procedures and Quality Assurance standards provided to you in discovery. SSA Knapp's role as a forensic explosives examiner is to marshal the forensic evidence and to draw conclusions based on his own observations of it, the conclusions of others who have examined it, and his training and experience and access to publicly accessible information and reference materials. The conclusions of others on whom SSA Knapp relied are referenced in his report: Explosives Chemistry -- David McCollam; Communications technology -- Forensic Examiner Michael McFarlane; Chemistry --Andria Mehlretter; Metallurgy – Kazanjian nee Marvin. Those scientists verified the conclusions in SSA Knapp's report with respect to their own analyses.

SSA Knapp's own analysis included the following processes, as well as reliance on the analyses of the other forensic examiners cited in his report:

(1) Visual inspection using a stereo microscope.
(2) Various measuring tools including, but not limited to: calipers, micrometer, digital multi-meter, stainless steel ruler and wire gauge.
(3) Various hand tools to assist in the examinations.
(4) Various computer and written references including, but not limited to the internet websites for each of the component manufacturers, as well as exemplars from each of the manufacturers.
(5) Actual side by side comparisons; and
(6) Photograph inspections.

SSA Knapp documented the measurements and relevant pieces of data that his unit collected with respect to a specific piece of evidence within his bench notes, which were provided in an earlier production. For your convenience, because SSA Knapp reviewed virtually all of the evidence submitted to the lab, we have segregated and attached these notes for you, which include some of the reference materials that he and his colleagues used. These notes, complete with photographs, are clearly identified with SSA Knapp's name and initials.

2. Dr. Kirk Yeager – Explosives

If the government does not call SSA Knapp, it will call Dr. Kirk Yeager to explain the relevant Explosives information to the court. Dr. Yeager will testify to those areas that SSA Knapp will testify to, with the exception of the fact that he did not draft a report of examination, and he was not managing the flow of evidence and analysis at the laboratory. Nevertheless, Dr. Yeager reviewed the significant evidence in the case, and consulted with other forensic scientists and personnel at the lab that analyzed the construction and assembly of the IEDs at issue. Dr. Yeager's methodology, therefore, was to review the evidence and notes, consult with the examiners, and apply his training and experience to arrive at the same conclusions as SSA Knapp.

3. Chemist Andria Mehltretter – Chemistry – Polymers

Qualifications
Chemist Andria Mehltretter is employed at the FBI Laboratory in Quantico, Virginia and is assigned to the Chemistry Unit at the Lab. As explained in detail in her previously provided resume, Chemist Mehltretter has extensive training and experience in the field of chemistry, including chemical analysis of sealants, tapes and wire insulations. Chemist Mehltretter has testified as an Explosives Chemistry expert previously in federal court. She will testify as an Chemistry expert based on her and her lab assistants' testing, and her knowledge, skill, experience, training and education. Chemist Mehltretter drafted two reports which describe the items that she reviewed, the tests she performed, her conclusions, and the basis for those conclusions. One of the reports deals primarily with polymer sealants and wires, and the other primarily with the chemical analysis of tapes and adhesives. Those reports are provided again with this disclosure, along with her CV and relevant notes, all of which are incorporated herewith.

Summary of Testimony
Chemist Mehltretter will explain the science of chemical analysis of paints, polymers, tapes, sealants and wires. Ms. Mehlretter will explain the science of chemical analysis of paints, polymers, tapes, sealants and wires. She will testify that some of the components of tape, silicon sealant and wires recovered from the bombing scenes (all of which are specifically identified in her reports) are chemically consistent with tape and wires found at 410 Norfolk Street and Dzhokhar Tsarnaev's dormitory room. Specifically, she will testify that: (a) electrical tape and wires recovered from the Marathon crime scene and the Watertown crime scene are chemically consistent with each other; (b) a roll of silver duct tape, a roll of Black Gorilla duct tape, and a roll of Cohere packaging tape recovered from 410 Norfolk Street are chemically consistent with items of evidence recovered from the Marathon crimes scene; (c) Teflon tape recovered from 410 Norfolk Street is chemically consistent with Teflon tape recovered from the Watertown crime scene; (d) sealant found with fragmentation and device components at Scene A on Boylston Street were colorless silicone rubbers, and at Scene B were a mix of colored silicone rubber sealant as well as an acrylic material; (e) sealants recovered at both scenes are chemically consistent with adhesion sleeves which embedded fragmentation recovered from victims at area hospitals; and (e) the sealants found on Boylston Street at Scene A, on Laurel Street, and among

the victims' bodies are chemically consistent with a tube of silicone recovered from 410 Norfolk Street.

To examine the duct tapes, Ms. Mehltretter used visual and stereomicroscopical observations, physical measurements, Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy with energy dispersive X-ray spectroscopy (SEM/EDS), and X-ray diffractometry (XRD). To examine the electrical tapes, she used visual and stereomicroscopical observations, physical measurements, FTIR, SEM/EDS, and pyrolysis-gas chromatography/mass spectrometry (py-GC/MS). To examine the packaging tapes, she used visual and stereomicroscopical observations, polarized light microscopy (PLM), physical measurements, FTIR, and py-GC/MS. To examine the PTFE tapes, she used visual and stereomicroscopical observations, FTIR, and py-GC/MS. To examine the sealants, she used visual and stereomicroscopical observations, FTIR, SEM/EDS, Py-GC/MS, X-ray fluorescence spectroscopy (XRF), Direct Analysis in Real Time Mass Spectrometry (DART-MS), and Raman spectroscopy. To examine the wire insulation, she used visual and stereomicroscopical observations, FTIR, SEM/EDS, and Py-GC/MS,

4. David McCollam – Explosive Chemistry

Qualifications

Forensic Examiner David McCollam is employed at the FBI Laboratory in Quantico, Virginia and is a senior chemist in the Chemistry – Explosives Unit at the Lab. As explained in detail in his previously provided resume, Examiner McCollam has extensive training and experience in the field of chemistry, including chemical explosives analysis. Examiner McCollam has testified as an Explosives Chemistry expert previously in federal court. Examiner McCollam will testify as an Explosives Chemistry expert whose qualifications are based on his and his lab assistants' testing, and his knowledge, skill, experience, training and education. Examiner McCollam drafted two reports which describe the items that he reviewed, the tests he performed, his conclusions, and the basis for those conclusions. The first report analyzed the items of evidence associated with the explosives recovered in the UMass dormitory room, and the Crapo Landfill, and the second report analyzed the items of evidence submitted to the lab from the Boylston Street and Watertown crime scenes. Those reports are provided again with this disclosure, in addition to his CV and relevant notes, and they are incorporated herewith.

Summary of Testimony

Forensic Examiner McCollam analyzed the evidence recovered during the course of the investigation and submitted to the FBI lab and determined the likely chemical materials that constructed the improvised explosive devices at issue in this case (on Boylston Street in Boston and those located in Watertown), the chemical composition of the unexploded explosives recovered in the investigation, and his analysis of other items evidencing manipulation of explosives materials found in various locations searched. Examiner McCollam will describe all of the explosives as low-explosives, which were consistent with extraction from pyrotechnic mixtures. He will also explain the principles and physics behind the explosion of low-explosives, the mechanics of deflagration and the chemistry behind the analysis of residue of explosions. After explosive materials are deflagrated (burned), they leave signatures of

chemicals, which through a series of tests (described below and in the lab worksheets previously provided), allow a scientist to the determine nature and characteristics of explosives.

Consistent with the testing, notes, test results and reports provided, McCollam documented the components submitted including the remnants of the IEDs in this case, the pipe bombs, parts, pyrotechnics, and other items of evidence which were submitted to the lab for explosives analysis. He concluded that the powder removed from the interior surfaces of the IEDs was low explosive, including pyrotechnic products, such as black powder propellant and pyrotechnic mix. He further concluded that the low explosive from each IED was consistent in chemical composition to each other. With respect to the pyrotechnics recovered at the dorm room and the landfill, McCollam concluded that they were all commercial-grade fireworks products, including mortar shells and roman candles.

Examiner McCollam examined several of the items of evidence collected from Boylston Street and at Dexter and Laurel in Watertown. The list of items that he forensically examined is included in his report. McCollam tested each of these items for explosive residue. After using acetone wash and water wash to determine whether the residues were organic or inorganic compounds, McCollam determined that the explosions were the result of low-explosives. McCollam's viewing of open source imagery of the explosions corroborated this understanding, because they included the white plumes of smoke, suggesting low explosives were involved. Conducting his examination using at least two techniques (one for determination and one for validation) McCollam determined the chemical composition of residue on these items, and determined that several of them contained the residue of low-explosive substances consistent with pyrotechnic powder. The list of items in evidence that contained explosive residues is also included in his report. Examiner McCollam determined the class characteristics of the explosive materials based on his examination and concluded that all of the relevant explosive residues were low explosives. Specifically, he determined that among the explosive materials that he detected, their combination was largely consistent with pyrotechnic materials, including nitrate and perchlorate based oxidizers with carbon, sulfur, aluminum, magnesium, and/or magnalium fuels, as well as barium. McCollam's examination of materials from each of the blast scenes on Boylston Street revealed residues consistent with post-ignition products from low explosive materials. At the crime scene on Laurel Street in Watertown, McCollam determined that low explosive pyrotechnic materials, as well as black powder were found in the intact pipe bombs and the Rubbermaid container, as well as residue from same in the variety of items that he and his lab tested for explosive residues. In addition, McCollam analyzed the powder in the Rubbermaid container with the hobby fuse, and determined that it was also low explosive pyrotechnic material. Hobby fuse found in Watertown also was determined to contain low-explosive materials as further described in the report.

Among the materials found at 410 Norfolk St., McCollam determined that hobby fuse and residue among tools that were seized contained smokeless powder residue, which constitutes a low-explosive propellant, as further described in his report.
Among the materials found in the second search of 410 Norfolk Street were samples that consisted of black powder and other residues that were consistent with low explosives, as further

described in the report. Some of the items, including vacuumed samples, constituted black powder, and some could be pyrotechnic mixtures.

From the Honda CRV at 410 Norfolk St., McCollam determined that latex gloves found in that vehicle contained residues consistent with combinations found in pyrotechnic materials. In addition, vacuumed samples and other areas of the vehicle also tested positive for similar materials, all as indicated in greater detail of his report at page 21.

From the Honda Odyssey at 410 Norfolk St., McCollam determined that vacuumed samples of the vehicle contained black powder low explosive. As detailed in his report, there were several items from which McCollam was unable to detect chemicals that were consistent with explosives or precursor chemicals, as described in his report. The fuses that were recovered on Laurel Street in Watertown tested positive for black powder low explosives.

The government anticipates that McCollam will testify about the nature and condition of the fireworks and explosive material found in Tsarnaev's backpack recovered from the Crapo Landfill, consistent with his report. In particular, McCollam is expected to testify that, based upon his examination and testing, the subject backpack contained three distinct types of commercially available pyrotechnic products. McCollam is expected to testify that he tested samples of the explosive powder found within these pyrotechnic products and believes that these items contained explosive powder. Further, in his opinion, many of the firework containers appear to have been manipulated or altered. Additionally, the pyrotechnics/fireworks containers appeared damp.

McCollam used generally accepted chemistry practices to test specimens for the presence of specific substances. For each test Mr. McCollam and his lab personnel engaged in, the notes and results of that analysis, along with the respective Q number, are included in the notes that we have previously provided to you. In addition, Mr. McCollam documented the measurements and relevant pieces of data that his unit collected with respect to a specific piece of evidence within his bench notes, which were provided in an earlier production. These notes, complete with photographs, are clearly identified with McCollam's name and initials.

Two or more of the following analytical techniques were utilized during the analysis of the submitted specimens: visual and microscopic inspection, flame susceptibility test, gas chromatography with electron capture detection, gas chromatography/mass spectrometry, gas chromatography with flame ionization detection, liquid chromatography/mass spectrometry, ion chromatography, x-ray powder diffractometry, Fourier transform infrared spectroscopy, and scanning electron microscopy with energy dispersive x-ray spectroscopy. More specifically, Ion Chromatography was used to determine whether the perchlorates and nitrates associated with low-explosive salts were present. By examining the cations and anions, and through the use of Scanning Electron Microscopy, a scientist is able to determine the likely chemical residue and can conclude the class characteristics of the precursor explosives. For those visible black powder residues, x-ray powder diffractometry was used. The Scanning Electron Microscope was also used for the items on which low explosive residue was detected. For each conclusion, McCollam used at least two techniques. In addition, McCollam and his laboratory used

techniques to determine whether high explosives had been used. These techniques included gas chromatography with Electron Capture Detection and McCollam's lab also occasionally employed circumstance-specific Fourier Transform Infrared spectroscopy. He used mass spectrometry to determine the nature of the smokeless powder residue, which left a scar on the metal can lid on which it was found that was consistent with smokeless powder and indicative of testing the deflagration of the substance. In order to determine whether hydrocarbons were present, he used gas chromatography with flame ionization detection. For each test the McCollam and his lab personnel engaged in, the notes and results of that analysis, along with the respective Q number are included in the notes that we have previously provided to you.

McCollam documented the measurements and relevant pieces of data that his unit collected with respect to a specific piece of evidence within his bench notes, which were provided in an earlier production. These notes, complete with photographs, are clearly identified with McCollam's name and initials.

5. Michael McFarlane – Electronics Engineer

<u>Qualifications</u>
Electronics Engineer Michael McFarlane is employed at the Operational Technology Division in Quantico, Virginia in the Digital Forensics Analysis Section. As explained in detail in his previously provided resume, Engineer McFarlane has extensive training and experience in the field of electronics engineering. Engineer McFarlane has testified as an Electronics Engineer expert previously in federal court. Engineer McFarlane will testify as an expert whose qualifications to testify about the evidence collected in this case are based on his and his lab assistants' testing and examination, and his knowledge, skill, experience, training and education. Engineer McFarlane drafted four reports which describe the items that he examined, the tests he performed, his conclusions, and the basis for those conclusions. Two of the reports simply documented that no further analysis of those items was necessary. His reports are provided again with this disclosure, along with his CV and they are incorporated herewith.

<u>Summary of Testimony</u>
Engineer McFarlane will testify to his examination of the electronic components that were recovered on Boylston Street and in other locations, attributed the components to different functions for each exploded IED on Boylston Street, and analyzed the significance of other electronics recovered. Engineer McFarlane will describe the electronic components to the Boylston Street IEDs, their compatibility, and how they function as a system. McFarlane will explain that the Boylston Street IEDs employed Remote control triggering technology, which consisted of a transmitter/receiver pair, a speed controller, and a power source, unique to each device. McFarlane will explain that for each IED, a transmitter was bound to a receiver, which was powered by a battery in the IED, and once a signal was activated, the receiver transmitted activated an electronic speed controller module, which sent a current as an output. McFarlane will explain radio-control technology as used in hobby cars and various variables to the efficacy and compatibility of the technology and will explain that each of the IEDs were likely exploded at close range by separate transmitters.

For Scene A – McFarlane prepared a report dated April 3, 2014. McFarlane examined each of the three items of evidence referenced in that report and determined that they consisted of pieces of a circuit board to an Exceed-RC Model 51 C809 Rally Monster EP electronic speed controller. The Explosives unit (See Knapp's report) had determined after review of remnants of the device that this was the hobby vehicle that had been cannibalized to create this IED, and McFarlane's review of items of evidence compared with the exemplar determined that they were consistent and had the same part number. McFarlane also determined that the remaining item of evidence from the scene was the remnants of a FlySky FS-GR3E receiver. McFarlane finally determined that the transmitter located at Laurel and Dexter Street in Watertown on April 19, 2013 was FlySky FS-GT3B transmitter. McFarlane determined that the FlySky devices were a transmitter/receiver pair and that they had the same bind code. McFarlane also determined that the Electronic Speed Controller in it unadulterated state, engages in an approximately 30 second series of outputs when it is first turned on. McFarlane determined that the transmitter had been modified and all of its control inputs had been disconnected. This resulted in the maximum power load being transmitted to through the electronic speed controller when the transmitter was activated. McFarlane will testify that this output would be sufficient to activate a Christmas tree light.

For Scene B – McFarlane prepared a report dated April 4, 2014. McFarlane examined each of the items of evidence referenced in that report and determined that they consisted of pieces of a circuit board to a Duratrax Sprint Electronic Speed Controller. McFarlane also examined the remnants of the receiver and determined it to be a Spektrum SR-201 receiver. McFarlane also examined the remnants of the battery pack and determined it to be a Tenergy battery pack. McFarlane was unable to recover a binding code for the Spektrum receiver. McFarlane determined that the exemplar receiver, power source, electronic speed controller system emitted an electric output, that is 4.624 Watts of power into a 10 Ohm load. McFarlane will testify that this output would be sufficient to activate a Christmas tree light.

Engineer McFarlane examined each piece of evidence to determine identifying characteristics such as make and model of an electronic component and then compared the component to an exemplar component of the same make and model. He conducted open source review of information about each of the components, including marketing materials as well as other reference materials. He acquired exemplars and tested whether the items were consistent with what the evidence showed.

For Scene A, McFarlane determined the bind code for the transmitter/receiver combination by first extracting the microchip from the receiver containing the bind code and reading its memory. Then he bound the transmitter with an exemplar receiver and read that receiver's bind code, and it was the same as the microchip from the receiver found on Boylston Street. In order to determine the power output for the electronic speed controller, Engineer McFarlane measured the outputs of the modified transmitter, the electronic speed controller and the receiver in the existing configuration. Using a chart that he attaches to his report, McFarlane concluded that depending on the power source, the exact amount of power output would be the maximum power available for the speed controller.

For Scene B, McFarlane did not have a transmitter recovered, so he acquired one that was compatible with the receiver in order to attempt to determine a bind code, but no bind code remained on the receiver. McFarlane powered the exemplar receiver and power source to register electrical resistance, current, and throughput power, and measured each of these using standard engineer's tools.

6. Joshua Friedman – Trace Evidence – Fibers

Qualifications

Physical Scientist and Forensic Examiner Joshua Friedman is employed at the FBI Laboratory in Quantico, Virginia in the Trace Evidence Unit. As explained in detail in his previously provided resume, Examiner Friedman has extensive training and experience in the field of Forensic Science and analysis of Trace evidence. Examiner Friedman has testified as a Trace Evidence expert previously in federal court. Examiner Friedman will testify as an expert whose qualifications to testify about the evidence collected in this case are based on his and his lab assistants' testing and examination, and his knowledge, skill, experience, training and education. Examiner Friedman drafted a 23 page report which describes the items that he examined, the tests he performed, his conclusions, and the basis for those conclusions. His report is provided again with this disclosure along with his CV and relevant notes, and they are incorporated herewith.

Summary of Testimony

Mr. Friedman will testify that fiber examinations can identify types of fiber such as animal (wool), vegetable (cotton), mineral (glass), and synthetic (manufactured). Questioned fibers can be compared with fibers from clothing, carpeting, and other textiles. A questioned piece of fabric can be matched to known fabric by examining its composition, construction, and color. Impressions on and from fabric also can be examined.

Mr. Friedman determined that textile fibers recovered from tape on items affected by, or part of, the Marathon bombs are consistent with the color, construction and composition of duct tape (Q725) found at 410 Norfolk Street.

Mr. Friedman used the standard protocols for examination of fiber evidence. An examination of the fabric portion of tape begins with the characterization of the fabric construction (e.g., woven, knit or non-woven) and an analysis of the fibers comprising the fabric. When all of the characteristics present in a fabric sample are the same as in a potential source, the possibility that the compared fabric originated from the same source cannot be excluded. Microscopical examination of fibers is accomplished by using one or more analytical techniques including stereomicroscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, and instrumentally using microspectrophotometry and Fourier transform-infrared spectroscopy. The microscopic characteristics and optical properties determined by these techniques are used for the examination and comparison of fibers. Fabric examinations are accomplished through visual and microscopic examination of the fabric construction and the fibers comprising that fabric.

7. Dr. Susan Marvin nee Kazanjian – Metallurgy

Qualifications
Dr. Susan Marvin is employed at the FBI Laboratory in Quantico, Virginia as a Forensic Examiner. As explained in detail in her previously provided resume, Dr. Marvin has extensive training and experience in the field of Metallurgy. Dr. Marvin has testified as a Metallurgy expert previously in federal court. Dr. Marvin will testify as an expert whose qualifications are based on her and her lab assistants' testing and examination, and her knowledge, skill, experience, training and education. Dr. Marvin drafted a 15 page report which describes the items that she examined, the tests she performed, her conclusions, and the basis for those conclusions. Her report is provided again with this disclosure, along with her CV and relevant notes, all of which are incorporated herewith.

Summary of Testimony
Dr. Susan Marvin will explain the field of Metallurgy. She will explain the properties of metals and how they leave forensic evidence when they are manipulated, broken, made and affected by explosive detonation. As identified by evidence number in her report, she will testify to the forensic review of the evidence seized that relates to the identification of the pressure cooker, and identification of the exemplar. Dr. Marvin observed many of the bbs and nails embedded in adhesive and observed pieces of pressure cookers. Dr. Marvin will describe the physical properties of the metal projectiles recovered from the crime scenes, such as the copper-coated steel bbs, small nails which were consistent with shoe tacks. She will explain that if these pieces were part of an explosive device, a detonation would render these small projectiles as missiles capable of penetration and damage into myriad surfaces. She will explain that the fragmentation she examined had consistent class characteristics with items found at 410 Norfolk Street and/or the UMass dorm room. Dr. Marvin will also describe the metals that she examined, when propelled explosive forces, can cause great physical harm to a human being under certain conditions.

In addition to visual examination, Dr. Marvin used physical examinations, optical microscopy, x-ray fluorescence spectroscopy (XRF) and microspot XRF (micro-XRF) (chemical composition tests) to analyze the items.

8. Forensic Examiner Alan Giusti - DNA

Qualifications
Forensic Examiner Alan Giusti is employed at the FBI Laboratory in Quantico, Virginia and is a DNA analyst in the DNA Casework Unit at the Lab. As explained in detail in his previously provided resume, Examiner Giusti has extensive training and experience in the field of biochemistry and DNA analysis. Giusti has testified as a DNA expert previously in federal court. Giusti will testify as a fingerprint expert whose qualifications to testify about the latent fingerprints recovered and matched in this case are based on his knowledge, skill, experience, training and education, as well as the preservation and comparison of the collected latent fingerprints. Examiner Giusti drafted several DNA reports which describe the items that he reviewed and analyzed, his conclusions, and the basis for those conclusions. Two of those

reports contain his analysis that will be the subject of his testimony. Those reports are provided again with this disclosure, along with his CV and relevant notes, and they are incorporated herewith.

Summary of Testimony

Mr. Giusti will testify that DNA is found in cell nuclei and encodes the information that makes an individual unique. A person gets half of his DNA from his father and half from his mother. Each cell in a person's body contains a complete copy of the person's DNA. Although 99.9% of the DNA in humans is identical, the remainder is so variable that no two persons, other than identical twins, have exactly the same DNA.

The basic building blocks of DNA are called nucleotides. Chromosomes are long chains of nucleotides. Segments of a chromosome are called genes. Genes determine physical traits (among other things). For example, there is a gene for eye color. In every person the gene for eye color can be found on the same place on the same chromosome. But the gene itself is not identical in every person: the chain of nucleotides that forms the gene can vary from person to person. These variations are called alleles. Alleles are responsible for the genetic differences among us.

Certain alleles consist of short tandem repeats or STRs, i.e. short nucleotide sequences that repeat over and over. Polymorphic alleles are ones in which the number of times the sequence repeats tends to vary from person to person. Scientists have identified many sites, or loci, in the human genome where polymorphic alleles consisting of variable short tandem repeats or VSTRs can be found. They have also calculated the likelihood that any two people will have the same number of STRs at each such site. Typically, the likelihood that two different people will have the same number of STRs at a given site is 20% or less. The more sites that are looked at, the less likely it is that two different people will have the same number of STRs at each of those sites.

Mr. Giusti will testify that he extracted DNA contributed by Tsarnaev as well as from a white Polo cap recovered from Tsarnaev's dormitory room. The DNA samples were extracted and amplified using Applied Biosystems AmpFISTR Identifiler kits and electrophoresed on a genetic analyzer for STR fragment analysis. The AmpFISTR Identifiler profiles (i.e. counts the number of STRs) at 15 particular genetic loci. It also provides a value for Amelogenin (sex indicator). Mr. Giusti then compared the genetic profiles from the two samples and determined that they matched. He also calculated that the expected frequency of a randomly selected unrelated individual having a DNA profile matching that obtained from the white Polo hat is equal to or less than 1 in 6 trillion.

Mr. Giusti analyzed the known and unknown DNA samples using the "PCR/STR" method, that is, he used polymerase chain reaction ("PCR") to amplify each sample, and then used the short tandem repeat method ("STR") to ascertain similarities or differences among alleles located at a certain number of loci in each sample. The PCR method is a well-established, peer reviewed laboratory process that copies a chosen portion of a DNA sequence millions of

times, the point being to generate enough of a sample for testing purposes. The PCR/STR analysis is used to target 15 core STR loci plus one locus that determines the gender of the donor, amelogenin. In performing the PCR method on both samples, Mr. Giusti will testify, he followed strict anti-contamination procedures, including the use of control tests to ensure that no foreign DNA contaminated the samples.

Giusti uses a commercial kit that is designed to detect or amplify those 15 loci: AmpFleSTR ldentifiler Plus PCR Amplification Kit. He will explain that Insufficient DNA quality and/or quantity can affect the ability to generate a DNA typing result and is not an absolute determination that an individual did not come into contact with an item of evidence.

Giusti will testify regarding the analysis performed in this case. Giusti will describe the process whereby the case was given a unique number and each item □in this case, the Polo baseball cap, as well as a known DNA sample from the defendant □s assigned its own number. Giusti will describe the process whereby it performed the first basic step as to each item: extraction of DNA. Giusti will describe the process whereby, once DNA was extracted from an item, it was quantified and, if necessary, diluted.

Giusti will testify that the amplified DNA in this case was loaded onto a genetic analyzer, and will describe how a particular sample was run. Giusti will testify that, after each particular sample was run, analysis software was utilized to determine what profile was present.

Giusti will testify regarding the DNA profiles that were obtained in this case, and how the profile on the hat matched the defendant's profile. All of the profiles tested appear in his previously provided bench notes. Giusti will testify regarding DNA □mixtures□and how Giusti determined that the defendant was the donor of the predominant DNA profile versus the profiles of other contributors to DNA on the hat.

Mr. Giusti will then testify about the statistical analysis he performed with respect to the matches between the known and questioned DNA samples, and how he calculated the statistical significance of the match by performing a random match probability analysis. As noted in his report, through the use of statistical databases containing genetic information on Caucasian, African, and two Hispanic populations, Mr. Giusti was able to predict the expected frequency of randomly selecting from a given population a person whose DNA profile happened to match that of the unknown sample at the determined loci.

Mr. Giusti will also testify that, after completing his analysis, another examiner at the MSP lab reviewed his findings to ensure that all procedures were performed correctly, the results were accurately interpreted, and the conclusions were correct. This review confirmed Mr. Giusti's conclusions. Mr. Giusti will also testify that he followed proper evidence handling techniques and requirements throughout the process of DNA extraction, amplification, and identification.

9. Elaina Graff – Fingerprints

Qualifications

Forensic Examiner Elaina Graff is employed at the FBI Laboratory in Quantico, Virginia and is a fingerprint examiner. As explained in detail in her previously provided resume. Examiner Graff has extensive training and experience in the field of fingerprint collection and examination. Examiner Graff has testified as a fingerprint expert previously in federal court. Examiner Graff will testify as a fingerprint expert whose qualifications to testify about the latent fingerprints recovered and matched in this case are based on her knowledge, skill, experience, training and education, as well as the preservation and comparison of the collected latent fingerprints. Examiner Graff drafted 20 fingerprint reports which describe the items that she reviewed, her conclusions, and the basis for those conclusions. One of those reports contains her analysis that will be the subject of her testimony. That report is provided again with this disclosure, as well as relevant notes and her CV, and they are incorporated herewith.

Summary of Testimony

Ms. Graff will testify to forensic review of evidence submitted to the FBI lab for the detection of fingerprints. Specifically, Ms. Graff will testify to those items on which the defendant’s fingerprints were found. A list of specific items is included in her reports labeled [INSERT relevant Reports]. She will testify that the defendant’s fingerprints were found at 410 Norfolk St. on a Swiss army knife (Q685.7), a CD envelope (Q685.6), a box cutter (Q707.7), a notebook (Q935.5), a page from a notebook found in the Honda Odyssey (Q731.10), a box from the defendant’s dorm room (Q736), the defendant’s dorm room window (Q1297), and a plastic container with hobby fuse recovered from the Watertown crime scene (Q781).

Based on her training and experience, Ms. Graff will testify as to the manner through which fingerprints are created and the factors that affect whether a fingerprint will be left when a person's finger or palm come in contact with an object. Generally, those factors may include (i) information about the individual (such as the condition of his or her hands, the depth of his or her ridges, whether the person's hands were dirty, wet, or contained any foreign matter such as dirt, grease, and the amount of sweat they produce); (ii) the nature of the surface being touched (in addition to the size of the surface, surfaces that are dirty, wet, pitted, rusty, porous, or ridged will all adversely affect the formation of recoverable prints), the manner in which the object is handled (if the fingers move along the surface, any prints will be likely to be smudged, or if the objects is rubbed against another surface after being touched, any prints created could also likely be destroyed, and atmospheric conditions (temperature, humidity, or the presence of any excess moisture may also affect the creation of fingerprints).

Ms. Graff is further expected to testify that fingerprints are recovered from evidence in a low percent of all examinations and will explain several reasons why. These include the fact that fingerprints are very fragile; that a fingerprint is not necessarily left at all when a person touches an object, for a variety of reasons, including environmental and/or physiological factors that can result in the individual in question not sweating or otherwise not having the ingredients necessary for fingerprints on his fingers at the time in question; that many surfaces often are poor surfaces for fingerprints; that even if a print or ridge detail is left on the surface of an item, it can easily be intentionally or unintentionally wiped off or smudged thereafter if the item comes in contact with clothing or some similar surface; and that physical barriers, such as gloves, can

prevent the transfer of prints from the fingers to the surface in question. Ms. Graff will also explain that on items of evidence with small amounts of flat surfaces susceptible to accepting prints and often with ridged surfaces, oils and bluing designed to impede rusting or dull the color of an item, the handling of an item, the use of protective gear, and gases discharged by an explosive event may adversely affect any existing prints.

Ms. Graff has received training in number of forensic fields, including basic fingerprint classification, latent fingerprint recovery, collection and preservation of physical evidence, and training regarding palm prints. She has testified as an expert witness in fingerprints in federal court.

Methodology

Ms. Graff will testify about the different kinds of prints (inked v. latent) and that her first step in examining an object was to process it for latent fingerprints. She will testify, in short, that she used a variety of techniques, including visual, cyanoacrylate, forensic light sources (such as 365mm spotlight with yellow filter), D stain, DFO, powder, and ninhydrin spray, which reacts with proteins present in residual prints, to highlight prints on the evidence. She was able to isolate latent prints that she determined were of sufficient quality (clarity) and quantity of detail for comparison to known prints. She also photographed the developed prints and enhanced the photographs as needed to best reveal print detail. Ms. Graff will testify about the factors affecting the quality of a latent print and their impact on forensic examination, including condition of the skin; type of residue holding the print; the mechanics of the touch that left the print; the nature of the surface touched; the size of the print; how the print is developed for comparison; and other factors.

Ms. Graff will testify that, using friction ridge analysis, she then compared the latent prints to known prints for the defendant and concluded that they were a match. Forensic Examiner Dee J. Fife collected the defendant's fingerprints, and while the collection of fingerprints does not constitute expert testimony, in an abundance of caution we provide notice of his testimony, and attach his C.V. Ms. Graff will discuss the steps she took during the examination of the latent and known prints, commonly called the "ACE-V" method, including analysis of the latent prints to determine suitability for comparison, followed by a side-by-side comparison with the known prints to ascertain similarities. When comparing prints, Ms. Graff will testify that she generally began with a common point identifiable on both prints and then, starting from that point, noted the flow of ridges and other identifying features moving outward. Ms. Graff will also testify about subsequent steps, including evaluation of similarities and differences between the prints to assess (a) whether a particular latent print could be individualized, (b) whether any sources could be excluded, or (c) whether the evaluation was inconclusive. She will discuss the factors used to determine matches between prints, including the three levels of detail in observation and comparison of anatomical aspects, like general morphology (overall size and shape, and presence of incipient ridges); ridge flow; ridge counts; shape of the print core; delta location and shape; the length of ridges; thickness and furrowing of ridges; pore position; crease patterns and shapes; and other determinants.

As memorialized in Ms. Graff's reports, she concluded that the latent prints described above, matched the known print for the defendant. She will discuss how that conclusion was independently confirmed by other examiners in her lab. She will testify regarding procedures used at the FBI lab to ensure proper handling and individualization of prints.

10. Erich J. Smith – Toolmarks

Qualifications
Physical Scientist is employed at the FBI Laboratory in Quantico, Virginia and is a specialist in Firearms and Toolmarks analysis at the Lab. As explained in detail in his previously provided resume [INSERT BATES NUMBER], Scientist Smith has extensive training and experience in the field toolmarks analysis. Scientist Smith will testify as a Toolmarks Analysis expert whose qualifications are based on his knowledge, skill, experience, training and education. Scientist Smith drafted a 21 page report which describes the items that he reviewed, his conclusions, and the basis for those conclusions. That report is provided again with this disclosure as [Bates], and is incorporated herewith.

Summary of Testimony

Mr. Smith will explain the science of toolmarks comparison. Mr. Smith will testify to the forensic review of evidence submitted to the FBI lab in which items recovered from the scenes where the IEDs exploded were compared to items seized from residences and other locations associated with the defendant. Mr. Smith concluded that the marks left by a wire-cutter seized at 410 Norfolk St. were found on insulated wires seized at the Watertown crime scene that were part of the toggle-switch triggering assembly of the pressure cooker IED that exploded there. The witness relied on microscopic examination of the wires and the wire-cutter in comparing them. The witness also used exemplars of the same make and model of the wire-cutter to determine if another cutter could have made the marks on the wires found in Watertown, and concluded that they could not.

Basis of Testimony
Toolmarks analysis is guided by the following principles: First, no one tool performs exactly the same on each occasion, even within several repetitions of the same motions. Every tool develops characteristics and peculiarities that are demonstrated in their usage and that are repetitive, and therefore, automatically transferred from one manifestation to the next. Second, no two tools share the exact same combination of characteristics, given sufficient quantity and quality of toolmarks to compare. Third, every tool has a certain level of commonality that cannot be dramatically distinguished while still maintaining the performance of the tool. That is, while two tools may both perform significantly similarly, to the extent that there is any difference, it is difficult to determine whether the difference is a result of make, manufacturer, or user.

Mr. Smith examined each of the items of evidence about which he will testify (namely the wires and the wire-cutter, as well as the attendant items of evidence discussed in his report). As summarized in his enclosed reports, Smith will testify that, in conducting the examinations in

this case, he analyzed and compared the toolmarks on Q582.2-582.4 with specimens Q725.10 (a wire cutter located at 410 Norfolk Street.). As listed in his report, Mr. Smith concluded that the marks cutting the wires that were connected to the toggle switch that was found in the remnants of the pressure cooker IED in Watertown, Q582.2, Q582.3 and Q582.4 were made by the wire cutter found at 410 Norfolk Street. Mr. Smith's notes relative to this comparison are included.

Toolmarks, whether they are present on two evidence items or on one evidence item and one test-mark created in the Laboratory, undergo two stages of comparison. First, the toolmarks are examined to determine and compare their class characteristics. The class characteristics of toolmarks include type of cutting action and the size and orientation of gripping or cutting surfaces. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist.

If two toolmarks or a tool and toolmark have incompatible class characteristics, an exclusion opinion is rendered. If (a) the degree of similarity is greater than the examiner has ever observed in previous evaluations of toolmarks known to have been created by different tools; and (b) the degree of similarity is equivalent to that normally observed in toolmarks known to have been created by the same tool, then a toolmarks examiner can conclude that the marks were made by a specific tool.

When these conditions are met the likelihood another tool could have produced the same mark is so remote as to be considered a practical impossibility. An Identification opinion cannot be reported unless a second qualified toolmarks Examiner has examined the items in question and reached the same conclusion.

If the conditions required for an Exclusion or Identification are not observed, an opinion of Inconclusive is rendered. A failure to meet the conditions for an Exclusion or Identification could be the result of limited microscopic marks of value, a lack of any observed microscopic similarity, or microscopic similarity that is present but too limited to meet the criteria for identification.

Toolmarks analysis is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to changes in tool working surfaces from wear, corrosion and abuse or the employment of unusual tool/work piece orientations, toolmarks created by the same tool are not always identifiable as such. Analysis requires a side-by-side comparison of questioned toolmarks and known tools. The numerous variations exhibited in the bodies of the toolmarks are observed to determine if there are significant similarities or differences between samples. The characteristics considered when conducting the comparison are those factors that remain consistent despite the variations in manners in which tools may be used. The weight of the examiner□s conclusion is determined by how many individual characteristics are shared by the known and questioned samples, and the significance attached to particular characteristics. Some of the physical characteristics that are assessed and compared are as follows:

-Style of toolmark (striations, sawing, pinching, crimping, slicing, burning, melting, etc.)
-Intensity of the toolmark
-Direction of mark
-Pressure of the toolmarks
- Lifts of the tools

At the evaluation stage of examination, observations from the analysis and comparison stages are compared and assessed. This evaluation is based on the training, knowledge, and experience of the examiner. To identify a questioned sample as that of a particular tool, significant characteristics must be found to be in common between the questioned sample and known markings left by the known tool, with no significant differences consistently observed. Individual characteristics may not be so unique when considered by themselves, but in combination with other observed characteristics, can show that a toolmark is unique to a particular tool. Conversely, to eliminate a tool as the one which potentially created a questioned toolmark, significant differences must be observed when comparing the questioned sample with known toolmarks. It is not always possible to render an opinion of identification, or elimination, based on the questioned toolmarks and known tools provided for examination. The samples themselves may impose limitations.

The final stage of the examination methodology is the verification of the analysis, comparison, and evaluation. In this step, a separate, FBI-certified document examiner verifies the results of the initial examiner using the methodology described in steps 1-3 above. Every forensic analysis performed by a member of the FBI Laboratory Firearms and Toolmarks Unit, including the analysis in this case, is reviewed by another examiner, both technically and administratively.

<u>Miscellaneous</u>

As in the case of those officers/agents who collected fingerprints, DNA, and digital data we do not consider those officers/agents to be expert witnesses. Nevertheless, in an abundance of caution, we provide notice that we will be calling witnesses who collected these things, who may have specialized knowledge and skill to be able to do so. They will testify to the fact that they collected these items by rolling fingers, taking swabs or blood, and imaging or uploading digital data with forensic software. As we continue to narrow the universe of exhibits to be used in our case we will provide you with the final list of these collecting officers/agents.

If you have any questions, please do not hesitate to call.

Sincerely,

CARMEN M. ORTIZ
United States Attorney

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